

Evidence-based Cancer Imaging Program  
Appropriate Use Criteria

# Low Back Pain

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Memorial Sloan Kettering  
Cancer Center



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## Background

The Evidence-based Cancer Imaging Program (ECIP) was established to ensure ongoing compliance with the Centers for Medicare and Medicaid Services (CMS) Appropriate Use Criteria Program by expanding upon our existing evidence-based practices at Memorial Sloan Kettering Cancer Center (MSK). ECIP develops and implements appropriate use criteria (AUC) for ordering advanced diagnostic imaging services, and takes into consideration the unique needs of patients with cancer and our expertise as a cancer center.

AUC are guidelines developed by our Imaging Disease Management Teams (IDMT) that link: a specific clinical condition or presentation; one or more imaging exams; and an assessment of the appropriateness of each exam. Using AUCs helps to achieve the goal that all patients receive only what imaging is best for them, while avoiding unnecessary tests.

## Abbreviations

Abbreviation	Definition
<b>AUC</b>	Appropriate use criteria
<b>CMS</b>	Centers for Medicare and Medicaid Services
<b>CT</b>	Computed tomography
<b>ECIP</b>	Evidence-based Cancer Imaging Program
<b>FDG</b>	Fluorodeoxyglucose
<b>IDMT</b>	Imaging Disease Management Team

Abbreviation	Definition
<b>IV</b>	Intravenous
<b>MRI</b>	Magnetic resonance imaging
<b>MSK</b>	Memorial Sloan Kettering Cancer Center
<b>OCEBM</b>	Oxford Centre for Evidence-Based Medicine
<b>PET</b>	Positron emission tomography



## Clinical Context

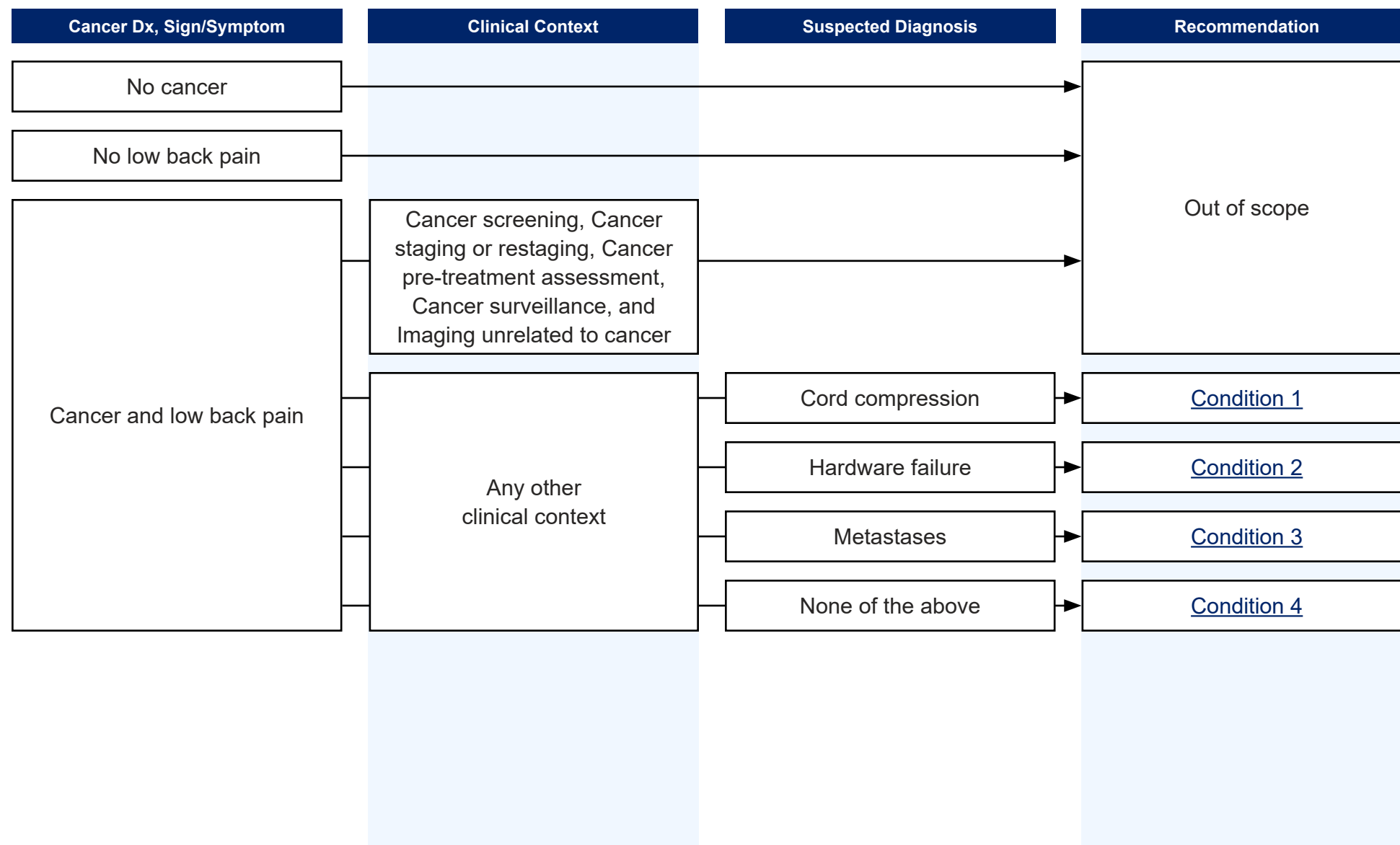
Clinical Context	Description	Relevant for this AUC?
Cancer screening	Neoplasm detection in asymptomatic patients. Imaging type and schedule informed by guidelines.	<input type="checkbox"/>
Neoplasm detection or diagnostic workup	Assessment of signs or symptoms concerning for neoplastic disease.	<input checked="" type="checkbox"/>
Cancer staging or restaging	Establishing location and extent of neoplastic disease. Restaging may occur after treatment or intervention.	<input type="checkbox"/>
Cancer pre-treatment assessment	Imaging performed to optimize the cancer treatment plan.	<input type="checkbox"/>
Therapeutic response assessment	Assessment of treatment response to guide subsequent management.	<input checked="" type="checkbox"/>
Therapeutic complication assessment	Evaluation of possible treatment-related complications or adverse events.	<input checked="" type="checkbox"/>
Cancer complication or comorbidity assessment	Evaluation of cancer or comorbidity-related complications or adverse events.	<input checked="" type="checkbox"/>
Cancer surveillance	Ongoing scheduled assessment of neoplastic disease status.	<input type="checkbox"/>
Survivorship	Assessment of long-term or late effects from cancer or cancer treatment as well as ongoing health needs of cancer survivors.	<input checked="" type="checkbox"/>
Imaging unrelated to cancer	Imaging obtained for indication or concern not related to cancer.	<input type="checkbox"/>

## Age

Adults only (≥ 18 years)



## Appropriate Use Criteria





## Condition 1: Low Back Pain, Cancer, Cord Compression Suspected

### USUALLY APPROPRIATE

#### **MRI total spine without and with IV contrast**

MRI total spine without and with contrast is usually appropriate as an initial study if readily available.

#### **MRI total spine without IV contrast**

MRI total spine without contrast may be useful if contrast is contraindicated.

### SOMETIMES APPROPRIATE

#### **MRI lumbar spine without and with IV contrast**

MRI lumbar spine without and with contrast is also appropriate as an initial study in cases where MRI total spine is not readily available.

#### **MRI lumbar spine without IV contrast**

MRI lumbar spine without contrast may be useful if contrast is contraindicated.

#### **CT total spine with IV contrast**

CT total spine with contrast is sometimes appropriate if MRI is contraindicated.

#### **CT lumbar spine with IV contrast**

CT lumbar spine with contrast is sometimes appropriate if MRI is contraindicated.

#### **CT myelography lumbar spine**

CT myelogram may be appropriate in certain situations where MRI is contraindicated or diagnostically equivocal.

### RARELY APPROPRIATE

#### **CT total spine without IV contrast**

#### **CT lumbar spine without IV contrast**

#### **FDG PET/CT head to toe/limbs**

#### **X-ray lumbar spine**

- MRI is more sensitive and specific than CT total spine especially for detecting intraspinal disease.

## Condition 2:

### Low Back Pain, Cancer, Hardware Failure Suspected

USUALLY APPROPRIATE	SOMETIMES APPROPRIATE	RARELY APPROPRIATE
X-ray lumbar spine		
CT total spine without IV contrast		
CT lumbar spine without IV contrast		





## Condition 3:

### Low Back Pain, Cancer, Suspected Metastases

#### USUALLY APPROPRIATE

##### **MRI total spine without and with IV contrast**

MRI total spine without and with contrast is usually appropriate as an initial study if readily available.

##### **MRI total spine without IV contrast**

MRI total spine without contrast may be useful if contrast is contraindicated.

##### **MRI lumbar spine without and with IV contrast**

MRI lumbar spine without and with contrast is also appropriate as an initial study in cases where MRI total spine is not readily available.

#### SOMETIMES APPROPRIATE

##### **MRI lumbar spine without IV contrast**

MRI lumbar spine without contrast may be useful if contrast is contraindicated.

##### **CT total spine with IV contrast**

CT total spine with contrast is sometimes appropriate if MRI is contraindicated.

##### **CT total spine without IV contrast**

CT total spine without contrast is sometimes appropriate if MRI is contraindicated.

##### **CT lumbar spine with IV contrast**

CT lumbar spine with contrast is sometimes appropriate if MRI is contraindicated.

##### **CT lumbar spine without IV contrast**

CT lumbar spine without contrast is sometimes appropriate if MRI is contraindicated.

##### **FDG PET/CT head to toe/limbs**

PET/CT is useful when MRI is nondiagnostic for detecting metastases.

#### RARELY APPROPRIATE

##### **CT myelography lumbar spine**

CT myelogram may be appropriate in certain situations where MRI is contraindicated or diagnostically equivocal.

##### **X-ray lumbar spine**

- MRI is more sensitive and specific than CT total spine especially for detecting intraspinal disease.



## Condition 4: Low Back Pain, Cancer

### USUALLY APPROPRIATE

#### **MRI total spine without and with IV contrast**

MRI total spine without and with contrast is usually appropriate as an initial study if readily available.

#### **MRI total spine without IV contrast**

MRI total spine without contrast may be useful if contrast is contraindicated.

#### **MRI lumbar spine without and with IV contrast**

MRI lumbar spine without and with contrast is also appropriate as an initial study in cases where MRI total spine is not readily available.

### SOMETIMES APPROPRIATE

#### **MRI lumbar spine without IV contrast**

MRI lumbar spine without contrast may be useful if contrast is contraindicated.

#### **CT total spine with IV contrast**

CT total spine with contrast is sometimes appropriate if MRI is contraindicated.

#### **CT total spine without IV contrast**

CT total spine without contrast is sometimes appropriate if MRI is contraindicated.

#### **CT lumbar spine with IV contrast**

CT lumbar spine with contrast is sometimes appropriate if MRI is contraindicated.

#### **CT lumbar spine without IV contrast**

CT lumbar spine without contrast is sometimes appropriate if MRI is contraindicated.

### RARELY APPROPRIATE

#### **CT myelography lumbar spine**

CT myelogram may be appropriate in certain situations where MRI is contraindicated or diagnostically equivocal.

#### **FDG PET/CT head to toe/limbs**

PET/CT may be appropriate when MRI is nondiagnostic for bone metastases.

#### **X-ray lumbar spine**

- MRI is more sensitive and specific than CT total spine especially for detecting intraspinal disease.



## Key Evidence

### LOW BACK PAIN

Ref No.	Published Evidence	Grade*
1	Algra PR, Bloem JL, Tissing H, Falke TH, Arndt JW, Verboom LJ. Detection of vertebral metastases: comparison between MR imaging and bone scintigraphy. Radiographics. 1991 Mar;11(2):219-232. <a href="#">PMID: 2028061</a>	4
2	Bredella MA, Essary B, Torriani M, Ouellette HA, Palmer WE. Use of FDG-PET in differentiating benign from malignant compression fractures. Skeletal Radiol. 2008 May;37(5):405-413. <a href="#">PMID: 18278491</a>	4
3	Buhmann Kirchhoff S, Becker C, Duerr HR, Reiser M, Baur-Melnyk A. Detection of osseous metastases of the spine: comparison of high resolution multi-detector-CT with MRI. Eur J Radiol. 2009 Mar;69(3):567-573. <a href="#">PMID: 18191356</a>	4
4	Chou R, Qaseem A, Owens DK, Shekelle P. Diagnostic imaging for low back pain: advice for high-value health care from the American College of Physicians. Ann Intern Med. 2011 Feb;154(3):181-189. <a href="#">PMID: 21282698</a>	3
5	Daffner RH, Lupetin AR, Dash N, Deeb ZL, Sefczek RJ, Schapiro RL. MRI in the detection of malignant infiltration of bone marrow. AJR Am J Roentgenol. 1986 Feb;146(2):353-358. <a href="#">PMID: 3484586</a>	3
6	Deyo RA, Diehl AK. Cancer as a cause of back pain: frequency, clinical presentation, and diagnostic strategies. J Gen Intern Med. 1988 May-Jun;3(3):230-238. <a href="#">PMID: 2967893</a>	4
7	Downie A, Williams CM, Henschke N, et al. Red flags to screen for malignancy and fracture in patients with low back pain: systematic review. BMJ. 2013 Dec;347:f7095. <a href="#">PMID: 24335669</a>	2
8	Hegmann KT, Travis R, Belcourt RM, et al. Diagnostic Tests for Low Back Disorders. J Occup Environ Med. 2019 Apr;61(4):e155-e168. <a href="#">PMID: 30694882</a>	5
9	Henschke N, Maher CG, Ostelo RW, de Vet HCW, Macaskill P, Irwig L. Red flags to screen for malignancy in patients with low-back pain. Cochrane Database Syst Rev. 2013 Feb;(2):CD008686. <a href="#">PMID: 23450586</a>	2
10	Herzog RJ, Ghanayem AJ, Guyer RD, Graham-Smith A, Simmons ED, Vaccaro A. Magnetic resonance imaging: use in patients with low back pain or radicular pain. Spine J. 2003 May-Jun;3(3 Suppl):6S-10S. <a href="#">PMID: 14589213</a>	5

Ref No.	Published Evidence	Grade*
11	Jarvik JG, Deyo RA. Diagnostic evaluation of low back pain with emphasis on imaging. Ann Intern Med. 2002 Oct;137(7):586-597. <a href="#">PMID: 12353946</a>	2
12	Johnson SM, Shah LM. Imaging of Acute Low Back Pain. Radiol Clin North Am. 2019 Mar;57(2):397-413. <a href="#">PMID: 30709477</a>	5
13	Joines JD, McNutt RA, Carey TS, Deyo RA, Rouhani R. Finding cancer in primary care outpatients with low back pain: a comparison of diagnostic strategies. J Gen Intern Med. 2001 Jan;16(1):14-23. <a href="#">PMID: 11251746</a>	4
14	Maus T. Imaging the back pain patient. Phys Med Rehabil Clin N Am. 2010 Nov;21(4):725-766. <a href="#">PMID: 20977958</a>	5
15	Patel ND, Broderick DF, Burns J, et al. ACR Appropriateness Criteria Low Back Pain. J Am Coll Radiol. 2016 Sep;13(9):1069-1078. <a href="#">PMID: 27496288</a>	5
16	Shah LM, Jennings JW, Kirsch CFE, et al. ACR Appropriateness Criteria® Management of Vertebral Compression Fractures. J Am Coll Radiol. 2018 Nov;15(11S):S347-S364. <a href="#">PMID: 30392604</a>	5
17	Wáng YXJ, Wu AM, Ruiz Santiago F, Nogueira-Barbosa MH. Informed appropriate imaging for low back pain management: A narrative review. J Orthop Translat. 2018 Aug 27;15:21-34. <a href="#">PMID: 30258783</a>	5

Notation	Consensus-based Statement	Grade*
§	<p>In addition to reviewing the published literature for evidence, the MSK NeuroOncology/Low Back Pain Imaging Disease Management Team leveraged consensus-based expert opinion and clinical best practices to supplement the evidence in this area to define the appropriate imaging guidelines for this clinical condition.</p> <p>Key points:</p> <ul style="list-style-type: none"> <li>• Patients with known cancer should be scanned when new low back pain develops or if the characteristics of low back pain change or progress.</li> <li>• In the presence of low back pain, imaging should be primarily directed to identify osseous metastases, benign or pathologic fractures, epidural disease and leptomeningeal disease.</li> </ul>	5

\*Grade assigned in accordance with the Oxford Centre for Evidence-Based Medicine (OCEBM) Levels of Evidence 2011: <https://www.cebm.net/2016/05/ocebml-levels-of-evidence/>



## Multidisciplinary Imaging Disease Management Team

### Memorial Sloan Kettering Cancer Center

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Radiologist
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Medical Oncologist
- **Marina Chilov, MLS**  
Research Informationist
- **Kendra Godwin, MLIS**  
Research Informationist
- **Meier Hsu, MS**  
Research Biostatistician
- **Eric Lis, MD**  
Radiologist
- **Chaya Moskowitz, PhD**  
Biostatistician
- **Adam Schmitt, MD**  
Radiation Oncologist

## Methodology

Details about our methodology can be found here:

<https://www.mskcc.org/departments/radiology/evidence-based-cancer-imaging/methodology>

## Resources

### CMS Appropriate Use Criteria Program Website

<https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/Appropriate-Use-Criteria-Program>

### MSK's ECIP Website

<https://www.mskcc.org/departments/radiology/evidence-based-cancer-imaging>

### OCEBM Levels of Evidence

<https://www.cebm.net/2016/05/ocebm-levels-of-evidence/>